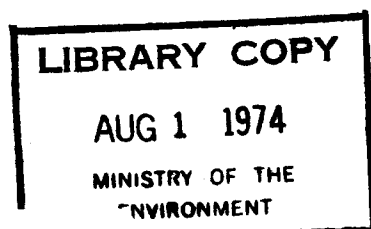


THE
ONTARIO WATER RESOURCES
COMMISSION

BIOLOGICAL STUDY
of
HUNSBURGER CREEK



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BIOLOGICAL STUDY OF
HUNSBURGER CREEK
(June - September 1971)

by
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BIOLOGICAL STUDY OF HUNSBURGER CREEK
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INTRODUCTION

An application from the City of Kitchener to take water from a recently-installed municipal well near Wilmot Centre (Wilmot Township) was received by the Water and Well Management Branch of the Division of Water Resources. Prior to their issuance of a Permit to Take Water, the same branch initiated an environmental study of Hunsburger Creek in 1971 with the ultimate purpose of insuring against critical surface water flow interference as a result of pumping from the underlying aquifer.

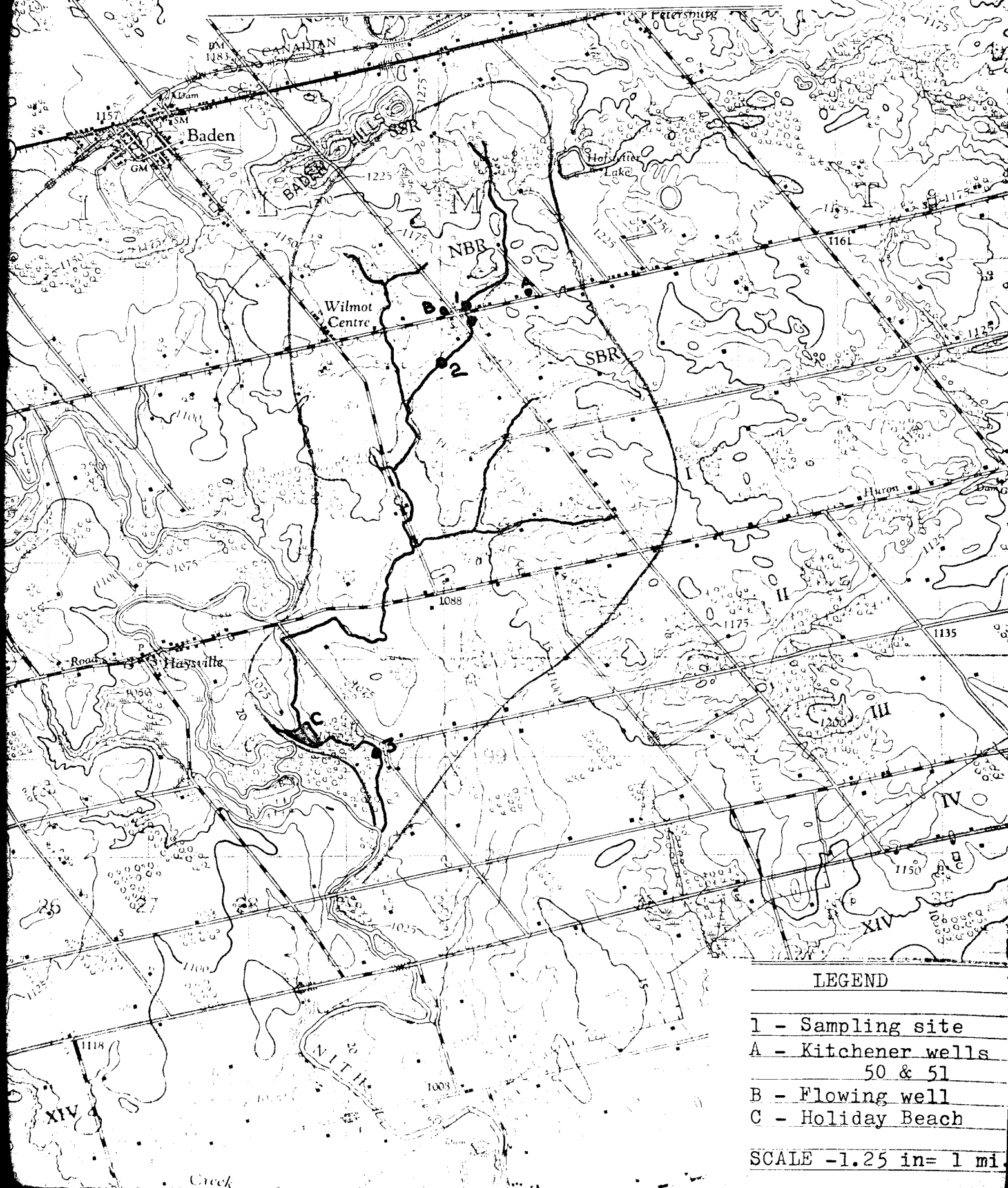
This report summarizes the results of the biological portion of the study from data collected from June to September 1971, by the Biology Branch.

METHODS

Bottom Fauna

At each of three stations indicated on Figure 1, macroinvertebrates associated with the creek bottom were collected in June, July and September. For a quantitative estimate of numbers, a square foot of substrate was sampled using a Surber Sampler. Also for a more complete qualitative estimate, hand-sieves were used to sample a variety of aquatic niches at each station. Organisms were preserved in ethanol and returned to the London Laboratory where they were identified.

Figure 1 - Map of Hunsburger Creek
Subwatershed



Fish

In June and July, electroseining techniques were used to obtain a rough estimate of types of fish present at stations 2 and 3. Owing to the small size of the stream of station 1 and its proximity to site 2, no sampling was conducted at 1. In June, a 300 foot section of stream was blocked off by seine nets and electroseined three times to obtain a quantitative estimate of the fish population. Most fish were identified in the field and returned to the creek although a few of the specimens which were difficult to identify were preserved and returned to the laboratory for accurate identification. Fish were sampled only qualitatively in July.

Physical-Chemical Characteristics

Observations on water temperature, clarity and other obvious physical characteristics were made during each biological sampling run. Field personnel from the Division of Water Resources aided in the collection of water samples and temperature information. A total of eight collections of water samples were made during June through September.

On July 19 and 20, dissolved oxygen concentrations were determined at each station at six four-hour intervals. Water temperature data complemented these determinations.

RESULTS

Bottom Fauna

Numbers and types of benthic organisms collected at each station during June, July and September may be found in Table I of the Appendix.

A total of 46 different macroinvertebrate taxa were found at the three sampling sites. The benthic association at all stations was typical of unpolluted water although organisms usually found in rapid-flowing cool streams were limited to the two uppermost stations. At each station throughout the year the benthic population was well established indicating a permanent flow from June through September.

Each station was unique in its variety of organisms and in seasonal variation of total numbers. Station 1 was represented by a total of 30 different taxa throughout the year, most of which (Stoneflies, Baetis, Limnephilus, Simuliidae) preferred appreciable current and cooler water temperatures. Total numbers of organisms increased from 52 per square foot in June to 281 per square foot in September. Nineteen different taxa were found at station 2 and once again, swift and cold-water forms (Stoneflies, Chimarra, Rhyacophila, Sortosa, Corydalidae) were common. Numbers per square foot decreased from 150 in June to 35 in September. Forms associated with cooler more rapid waters were rare at station 3 where 24 different taxa were found. Taxa such as Cheumatopsyche, Hydropsyche, Physa, Helisoma - typical of warmer southwestern Ontario streams - dominated the population which attained a density of roughly 150 organisms per square foot during July and August.

Fish

An inventory of types and numbers of fish collected at stations 2 and 3 in June and July is presented in Table II of the Appendix.

A total of 18 different taxa were found at stations 2 and 3 although the variety found at each station differed greatly. Brook trout and cold-water forms often associated with trout waters (redbelly dace, blacknose dace, sculpins and ammocoetes of the American brook lamprey) were limited to the upper reaches of the creek. Warm-water species more widely distributed throughout southwestern Ontario were found at station 3. Approximately 100 individuals were fished from 300 feet of stream at station 2 while 50 were caught at station 3.

A single rainbow trout observed at station 1 in September most likely originated from a pond of one of six landowners in the basin who has constructed improved trout ponds.

Department of Lands & Forests officials reported that a natural brown trout population was practically eliminated as a result of a fish kill in 1965.

Physical-Chemical Characteristics

Results of chemical determinations on 8 water samples collected at stations 1, 2 and 3 during the period from June through September are indicated in Table 1 of the text. Water temperature data are also included.

In general, water at stations 1 and 2 was clear and aquatic weed growth was sparse. It was noted during June and July that the water at station 3 was turbid and periphyton growth was common. In September, water was clear at station 3 although periphyton growth covered roughly 80% of the riffle area. Water temperatures increased from an average of 11°C at station 1 to 16°C at station 2 and 22°C at 3. Ponds

Table 1. Average concentrations and range of chemical parameters at three sampling locations on Hunsburger Creek. (Average of eight collections from June through September 1971.)

PARAMETER (ppm)	STATION					
	1		2		3	
	AVG.	RANGE	AVG.	RANGE	AVG.	RANGE
B.O.D.	.7	(.4-1.0)	1.9	(.4-2.4)	3.6	(2.4-7.0)
SOLIDS - Total	324	(310-350)	333	(300-480)	300	(250-340)
Suspended	9	(5 - 15)	13	(5 - 30)	19	(10 - 25)
NITROGEN Kjeldahl	.23	(.12-.30)	.31	(.10-.44)	.64	(.26-.94)
(as N) Ammonia	.08	(.01-.17)	.04	(.01-.11)	.05	(.01-.16)
Nitrite	.023	(.004-.076)	.009	(.003-.028)	.052	(.034-.074)
Nitrate	.20	(.15-.27)	.16	(.01-.28)	1.96	(.18-2.50)
PHOSPHORUS Total	.027	(.013-.052)	.046	(.028-.11)	.085	(.020-.24)
(as P) Soluble	.009	(.005-.017)	.004	(.001-.009)	.006	(.001-.019)
CONDUCTIVITY (mohms/cm ³)	496	(484-506)	476	(463-485)	415	(377-439)
ALKALINITY	231	(215-239)	223	(208-323)	179	(150-238)
CHLORIDES	6	(4 - 8)	6	(4 - 8)	9	(6 - 10)
TURBIDITY UNITS	2.8	(1 - 6)	6.3	(1 - 15)	8.3	(1.5-15)
pH AT LAB	7.8	(7.4-8.1)	8.0	(7.6-8.1)	8.1	(7.5-8.4)
TEMP (°C)*	11	(8 - 14)	16	(10 - 20)	22	(16 - 26)

* 1 reading each month

between stations 1 and 2 were likely responsible for the temperature increase at site 2. Extensive unshaded areas of the creek as it ran through agricultural land and the Holiday Beach recreation pond were responsible for the additional increase in average temperatures at station 3.

Average concentrations of most chemical parameters increased with progress downstream but water appeared to be of good chemical quality at each sampling site. Most outstanding were increases in average levels in inorganic nitrogen at station 3 (2.06 ppm) which exceeded concentrations at station 2 by a factor of ten. Since soluble phosphorus levels remained relatively constant from station 1 through station 3, the high nitrogen level was at least partially responsible for the abundant periphyton growth at station 3 in September.

Averages and ranges of dissolved oxygen concentrations at each station during a 24-hour period on July 19 and 20 was indicated in Table 2. Figure 2 shows the diurnal oxygen curve for each station on the same date.

Table 2. Average and range of dissolved oxygen concentrations at three stations on Hunsburger Creek (July 19-20, 1971). Determinations were conducted at each station at six four-hour intervals.

STATION	DISSOLVED OXYGEN					
	Average ppm	% sat'n	Maximum ppm	% sat'n	Minimum ppm	% sat'n
1	8.5	(76%)	10	(93%)	8	(69%)
2	7.2	(73%)	8	(86%)	5	(50%)
3	7.3	(80%)	10	(117%)	6	(63%)

At station 1 little variation occurred in concentrations of dissolved oxygen on a 24-hour basis with levels ranging between 8 and 10 ppm. At station 2 however, concentrations were variable ranging from 8 ppm during daylight hours to 5 ppm for a short period in early morning darkness. This oxygen regime barely satisfies the guideline for coldwater biota in OWRC's "Guidelines and Criteria for Water Quality Management in Ontario", June 1970. During darkness at station 3, dissolved oxygen concentrations fell to 6 ppm but increased to 10 ppm during daylight. Levels of dissolved oxygen did not become critical since the 5 ppm guideline for warm-water biota applied at this location.

SUMMARY AND CONCLUSIONS

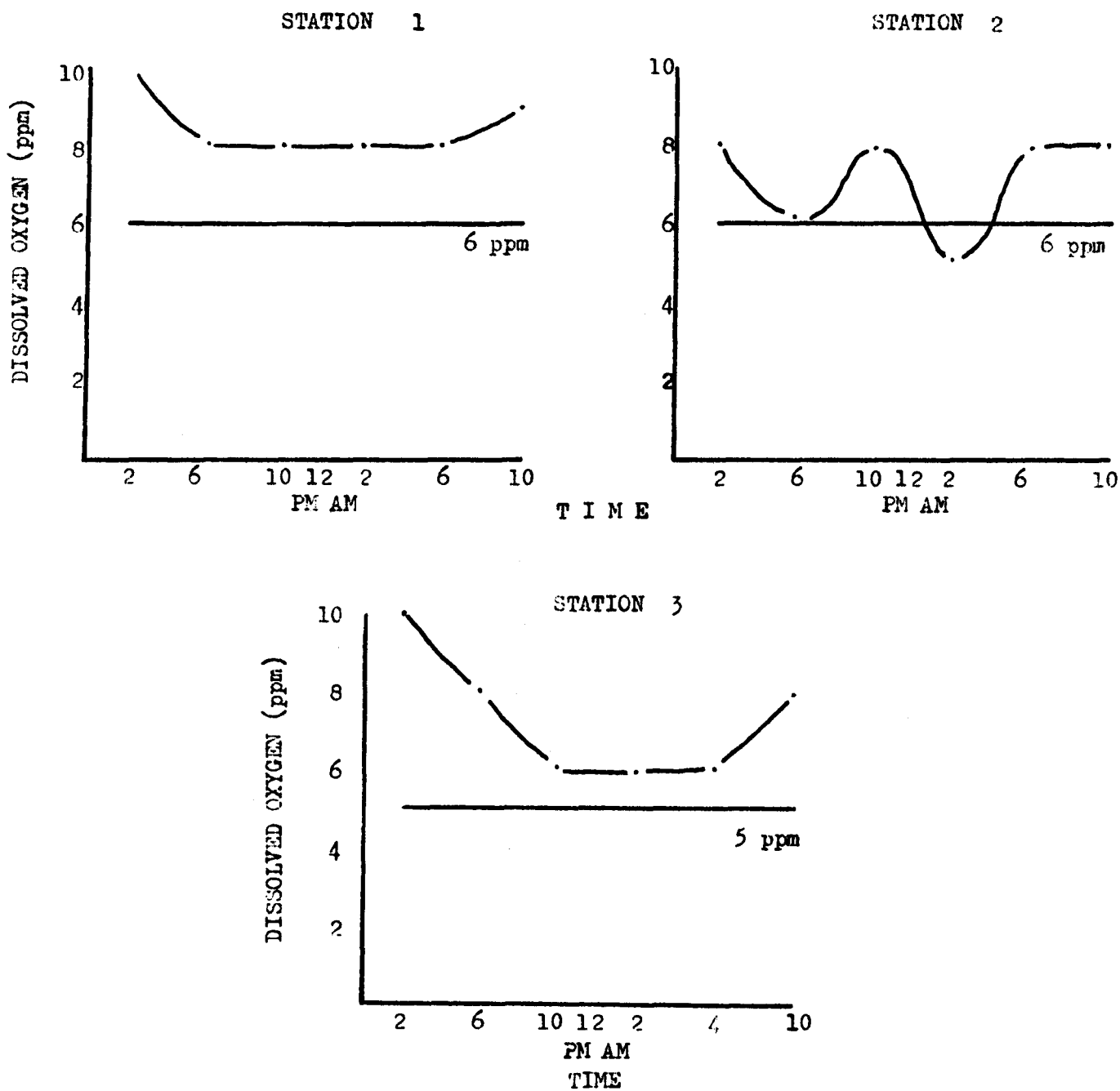
The benthic association at all stations was typical of unpolluted water although organisms usually found in trout streams were limited to stations 1 and 2. Benthic populations were well established indicative of a permanent flow from June through September.

Cold-water species of fish associated with trout waters were found from station 2 upstream whereas warm-water species more commonly found in southwestern Ontario dominated the fish population at station 3.

Water clarity declined noticeably at station 3 and aquatic vegetation growth increased significantly. Average water temperatures doubled from 11°C at station 1 to 22°C at station 3.

Concentrations of most chemical parameters increased with progress downstream but generally, water remained of

FIGURE 2: Diurnal Oxygen Curves for Three Sampling Sites on Hunsburger Creek (July 19-20, 1971).



good chemical quality throughout. Diurnal levels of dissolved oxygen decreased to marginal levels at station 2 during darkness. Variation between maximum and minimum concentrations of dissolved oxygen during a 24-hour period increased with progress downstream.

A reduction of flow in the upper reaches of Hunsburger Creek would have significant effects on naturally-occurring cold-water biota. The construction of ponds, clearing stream banks of vegetation cover and the natural decrease in flow rate in the lower reaches of the stream have resulted in a doubling of average water temperatures from station 1 to 3. A reduction in flow would warm the stream further, jeopardizing cold-water species at stations 1 and 2. The National Technical Advisory Committee of the U.S. Federal Water Pollution Control Administration recommends a maximum temperature of 68°F (20°C) for satisfactory growth of trout. At present, stations 1 and 2 are well within this guideline. Oxygen concentrations at station 2 were marginal for cold-water biota in mid-July and reduced flows would depress these levels even further.

APPENDIX

Table I - Numbers and types of benthic organisms collected at 3 locations on Hunsburger Creek in June, July and September, 1971.

Table II- Types and numbers of fish collected from two stations on Hunsburger Creek in June and July, 1971.

Table 1. Numbers and types of benthic organisms collected at 3 locations on Hunsburger Creek in June, July and September, 1971.

ORGANISMS	S T A T I O N								
	June	1 July	Sept.	June	2 July	Sept.	June	3 July	Sept.
STONEFLIES (unident)	1			1					
MAYFLIES					P				
<u>Baetis</u>	1	79	160	4		1			
<u>Caenis</u>	2						P		
<u>Paraleptophlebia</u>				76					
<u>Stenonema</u>				4		5	1		
CADDISFLIES (unident)			P						
<u>Cheumatopsyche</u>	1			12	3	1	8	65	110
<u>Chimarra</u>				8	34	13			
<u>Helicopsyche</u>								9	
<u>Hydropsyche</u>	1		7	6	4		3	44	24
<u>Lepidostoma</u>	P								
<u>Limnephilus</u>	P	P	3						
<u>Neophylax</u>	1								
<u>Psychoglyphia</u>		P							
<u>Psychomyiidae</u>							1		
<u>Pycnopsyche</u>	1								
<u>Rhyacophila</u>				8	3	2			
<u>Sortosa</u>				11		11			
pupae	5		P						
HELGRAMITES									
Corydalidae				2	2	2			
DRAGONFLIES (unident)							P		P
DAMSELFLIES (unident)							P		P

Table 1. Continued

		S	T	A	T	I	O	N					
		1						2			3		
ORGANISMS	June	July	Sept.	June	July	Sept.	June	July	Sept.	June	July	Sept.	
TRUEFLIES													
Chironomidae	32	5	5	2	1		5	18	1				
Ceratopogonidae	P	P					P						
Empididae			1										
Simuliidae		51	87	1									
Tabanidae	P	2	3	1									
Tipulidae		8	4	4	1		7	3					
BEEETLES													
Dytiscidae	1		1										
Elmidae				5	1								2
Psphenus							1	1					
unident. adults	2	4	P	2			6	12	12				
BUGS													
Corixidae		P								P	P		
Notonectidae		1					P						
AMPHIPODS													
Hyallolella azteca	P			P			P	P					
Crangonyx	1		P										
ISOPODS													
Lirceus							P						

Table 1. Continued

ORGANISMS	S T A T I O N								
	June	1 July	Sept.	June	2 July	Sept.	June	3 July	Sept.
CRAYFISH									
<u>Orconectes propinquus</u>							P	P	P
<u>Cambarus robustus</u>					2				
SNAILS									
<u>Gyraulus</u>	1								
<u>Physa</u>	1	4	P				P	1	P
<u>Helisoma</u>							P		P
CLAMS									
<u>Sphaerium</u>	P			2	34	P	P	P	P
<u>Pisidium</u>	P		P						
FLATWORMS									
			P	1		P	P	1	4
LEECH									
Sp.A	P	1	1						
Sp.B		P	2						
WORMS									
Tubificidae	1	4	6				P	1	
Lumbriculidae			1				P		
TOTAL TAXA	21	14	17	18	11	9	21	13	12
TOTAL ORGANISMS	52	164	281	150	85	35	32	155	153

Table II. Types and numbers of fish collected from two stations on Hunsburger Creek in June and July, 1971.

FISH	S T A T I O N			
	June	July	June	July
White sucker	45	61	13	16
Hog sucker		10	1	15
Northern redhorse sucker			2	
Fathead minnow	1			
Bluntnose minnow	2		1	
Common shiner		2	18	4
Creek chub	9	14	3	4
Hornyhead chub			5	
Redbelly dace	1	10		
Blacknose dace	25	18		
Stone cat				5
Rock bass			2	7
Fantail darter			3	
Johnny darter			1	1
Mottled sculpin	5	3		
Brassy minnow		1	1	
Brook trout	1			
American brook lamprey	17	8		
No. Species	9	9	11	7
No. Individuals	106	127	50	52